Letter to the Editor

Title: Removing the Bicuspid Source of Aortopathy Prevents Further Dilatation

Comment on: *Bicuspid aortic valve disease and ascending aortic aneurysm: should an aortic root replacement be mandatory? Eur J Cardiothorac Surg. 2016;49:103-9*

Author Names & Affiliations

Pouya Youssefi[1]

Marjan Jahangiri[1]

[1] Department of Cardiothoracic Surgery St. George's Hospital, London, UK

Corresponding Author:

Marjan Jahangiri

Email: marjan.jahangiri@stgeorges.nhs.uk

Keywords: Bicuspid aortic valve; aortic aneurysm; aortic root dilatation

We read with interest the article by Vendramin and colleagues in which they reviewed 166 consecutive patients with bicuspid aortic valve (BAV) who underwent either the Bentall procedure or aortic valve replacement with supracoronary ascending aorta replacement (SAAR) [1]. They found no progressive dilatation of the native aortic root in the SAAR group, regardless of whether the pre-operative root diameter was <40mm or >40mm, with a mean follow-up of 73 ± 39 months.

Although bearing a number of limitations such as small sample size, limited follow-up, and no data on the morphology of BAV cusp fusion, their results show positive correlation with our group's data on 5-year follow-up of remaining aorta dilatation after aortic valve replacement (AVR) or aortic root replacement (ARR) in patients with BAV [2]. We analysed 395 (192 BAV, 203 TAV) patients who underwent AVR or ARR. An ascending aorta / root diameter ≥ 45mm was an indication for Bentall procedure. We found no significant dilatation of the remaining ascending aorta or arch after AVR or ARR at 5 years.

These results lend further weight to the haemodynamic explanation of BAV-related aortopathy. The thoracic aorta experiences highly variable flow characteristics, where the morphology of the aortic valve can significantly impact on the velocity and symmetry of blood flow in the aorta [3]. Aneurysm formation is greatly affected by haemodynamic factors, and a number of biomechanical forces have been the subject of intense research in linking BAV morphology with aneurysm formation. Wall shear stress (WSS) is the force per unit area exerted by a moving fluid in the direction of the vessel, and a pathophysiological stimulus leading to extracellular matrix remodelling and gene expression. Lower WSS has been linked with vessel wall thickening and plaque formation in the carotid arteries, whereas high WSS has been linked with aneurysm formation in cerebral arteries [4]. 4D flow MRI studies by Mahadevia et al. [3] showed high WSS in the greater curvature of the ascending aorta, a common site of dilatation in BAV aortopathy. This correlated well with various studies by

Della Corte and colleagues who found that medial degeneration, type I and III collagen reduction, and smooth muscle cell apoptosis were more severe in the greater curvature of BAV aortas [5]. Further work by Guzzardi et al. has shown a link between elevated WSS and increased expression of transforming growth factors and matrix metalloproteinases, indicating ECM dysregulation with high WSS [6].

The data from Vendramin and colleagues showed significantly more aortic stenosis in the SAAR group. Interestingly, the SAAR group showed postoperative aortic root diameters significantly smaller than pre-operative (follow-up 73 ± 39 months). BAV associated with aortic stenosis generates eccentric high velocity jets which produce high WSS levels. Replacement of this pathological valve would remove the source of shear stresses on the root and ascending aorta.

There is sufficient clinical, haemodynamic and pathological evidence now to warrant an individualized functional approach to the assessment and management of aortopathy beyond traditional treatment guidelines.

Conflicts of Interest: None declared

References

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